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ABSTRACT

The replication study examined the effectiveness of a self-recording procedure to increase the levels of academic performance and production in 18 primary-aged mildly mentally handicapped children enrolled in either a self-contained or a resource class. Subjects were instructed in a self-recording procedure to track the number of worksheets accurately and neatly completed daily by each subject. Reinforcers included edibles, activities, and tangibles. Analysis of findings supported the value of self-recording and self-monitoring to the development of self-control behaviors. Better performance was documented by the self-contained group during the treatment phases. Both groups continued to perform near the maximum levels during the thinning and maintenance period. Results also indicated that systems which place increased responsibility on students for behavior control within the context of an overall management system may significantly improve academic performance. A bibliography, graphs, statistical data, and sample self-recording cards complete the report. (DB)

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SELF-RECORDING TO INCREASE ACADEMIC PERFORMANCE AND PRODUCTION IN PRIMARY-AGED MILDLY MENTALLY HANDICAPPED STUDENTS

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INTRODUCTION

During the past twenty-five years, much has been written about the acclimation of the mentally handicapped into the mainstream of society. As a result, the trend in service delivery has been directed toward directed behavior change methods and self-control techniques (Howell, Rueda, & Rutherford 1983; Kurtz & Neisworth, 1976; Mahoney & Mahoney, 1976). The need of the mentally handicapped to achieve greater personal independence is based on a number of factors. Among these are: economics in terms of time and finances to families and service providing agencies and the observation that prolonged dependence on others by the mentally handicapped alters and further reduces growth in personal reliability (Mahoney & Mahoney, 1976). It is critical that methods and techniques be developed which encourage and foster independent, self-reliant skills in the mentally handicapped.

This research is a replication of a 1987 study in which a self-recording procedure was successfully implemented to increase the levels of academic performance and production in a group of primary-aged mildly and moderately mentally handicapped students. The hypothesis in the prior study was that when the proper motivation to increase the levels of academic performance and production was present, a noticeable difference in on-task behavior would occur. This supported the position taken by Rooney, Polloway, and Hallahan (1985) that an increase in on-task behavior resulting from a self-monitoring

procedure may lead to an improvement in academic achievement. An underlying motivation for both studies concerns the importance of proper socialization skills for the mentally handicapped (Studwell & Moxley, 1984; Sugai & Rowe, 1984). Personal observations have indicated that the mentally handicapped, without assistance, do not easily acquire the skill to evaluate the impact of their behavior on the immediate environment.

Howell, Rueda, and Rutherford (1983) report that self-control results from combining several sub-skills, which include self-recording and self-monitoring, self-evaluation, and self-reinforcement. Hughes and Hendrickson (1987) and McLaughlin, Krappman, and Welsh (1987) describe self-control or self-management as including the techniques of self-assessment, self-recording, self-evaluation (self-determination of reinforcement), and self-reinforcement (self-administration of reinforcement). Skills in self-monitoring and self-awareness are crucial to developing self-control in that they heighten the consciousness of one's own behavior and the ability to recognize changes in behavior in the environment (Sugai & Rowe, 1984). According to Kurtz and Neisworth (1976), self-control is characterized by a measurable change in behavior which is instigated by the individual. A child who demonstrates self-control develops and initiates a plan to alter his own behavior without the assistance of adults. These researchers describe self-observation as the regulation of one's own behavior through a self-modification procedure. Thus, the behavior

being monitored is affected by the actual observation of its impact on the environment.

Self-recording is described by Howell, Rueda, and Rutherford (1983) as differing from self-monitoring. In self-monitoring, it is the decision of the individual when and if to record; it is self-motivated and intrinsic. Hughes and Hendrickson support this by indicating that self-monitoring is a combination of self-assessment and self-recording and requires "a student to make a judgment as to whether a behavior has occurred and, if so, to record its occurrence" (1987, p. 226). Mahoney and Mahoney concur by stating that in self-monitoring "the individual collects data on his own ABC's - antecedents, behaviors, and consequences" (1976, p. 338). However, in self-recording the individual records based on instructions applying to a particular situation or an instruction provided by another individual, or both (Howell, Rueda, & Rutherford, 1983). Ridley cites the results of several studies which indicate greater effectiveness in self-recording procedures "when used for maintenance rather than for establishing the target behavior" (1986, p. 232). In these cases, participant behaviors were first evaluated by others and then given acceptable criterion to establish the desired behaviors before independent participation was allowed. She also points out that self-recording promotes student independence while encouraging additional proper behaviors and requires that behavior be self-evaluated before recording can take place. Similarly, Hughes and Hendrickson state that "self-

recording requires making a formal note when a target behavior occurs" (1987, p. 226). Additional effects of self-recording are reported by Sugai and Rowe (1984) as heightening a subject's awareness of the target behavior and recognizing the necessity for change.

One problem for all self-management procedures is the possibility of cheating. This is described by Lewis and Blampied as "the self-award of tokens despite failure to meet performance criteria" (1985, p. 353). Further, they recommend that appropriate behaviors be explicitly outlined and that "generalization and maintenance procedures need to be devised that are appropriate to the particular case" (1985, p. 353).

Based on analysis of the literature, it appears that self-recording is one of the most basic and primary sub-skills for the acquisition of self-control behaviors. According to Kurtz and Neisworth,

> Even young children can be taught to mark a card, or to move marbles, from one container to another as they complete learning units or intervals. This procedure itself may strengthen the behavior being self-recorded (1976, p. 215).

The notion that posting the results of self-observation may provide some sort of motivation toward a goal is worthy of consideration. It also signals self-awareness of the impact of one's behavior on others and may lead to the development of the remaining self-control sub-skills: self-evaluation and self-reinforcement. The present study, therefore, sought to increase the levels of academic performance and production

through a self-recording procedure for a group of primary-aged mildly mentally handicapped students.

An ABAB reversal design was employed in both the 1987 and the present study and incorporated the use of reinforcement for the self-recording procedure based on quality and quantity of work. Additionally, in the present study, an increase in the criterion for delivery of reinforcement and a thinning phase were included. Authors such as Frith and Armstrong (1986) support the use of external reinforcement, whether verbal or tangible, for students who achieve a pre-determined level of performance even when no set criterion apply. McLaughlin, Krappman, and Welsh (1985) cite further data in which students increased academic production using self-control procedures within an ongoing token economy system.

The use of reinforcement or external controls in self-recording procedures specifically, and in self-management procedures in general, for both regular and special class populations has been challenged in the literature by various authors (Hallahan, Hall, Ianna, et al, 1983; Lewis & Blampied, 1983; Rooney, Hallahan, & Lloyd, 1984; Sugai & Rowe, 1984; McLaughlin, Krappman, & Welsh, 1985; Hughes & Hendrickson, 1987). Reasons cited for this criticism include the demands on teacher time, the dependency of subjects on external controls, and the lack of active involvement by subjects in the management of their own behaviors. These criticisms of external reinforcement are cited in the same studies as being advantages of a self-management procedure. However, Hughes and

Hendrickson acknowledge that "...behavior change procedures such as self-management or self-control" represent "...a form of external manipulation...particularly promising for classroom teachers" (1987, p. 226).

External reinforcement was utilized in both studies because of the researchers' knowledge that the students responded favorably to such treatment. Its use was viewed merely as the most effective means to achieve the studies' major aims and purposes, i.e. to gather data for research purposes and to improve the overall functioning of the students in the research classroom.

METHOD

Subjects and setting

The subjects (Ss) in this study were eighteen primary-aged public school students enrolled in either a self-contained or resource class for the mildly mentally handicapped located in the rural southeast. Both classes were instructed by experienced teachers certified in mental retardation and assisted by the same part-time para-professional with a background in special education. All Ss had been referred to the program through the Student Support Team, found to meet the applicable eligibility standards through intelligence and academic testing, and placed by the special education committee according to local and state guidelines. The range of IQ scores, as determined by the WISC-R, was 44 to 69, with a mean

IQ of 59. The chronological ages ranged from 7 years 3 months to 9 years 1 month, with a mean age of 8 years 1 month. The range of mental ages was from 3 years 6 months to 5 years 7 months, with a mean of 4 years 4 months, as measured by the Peabody Picture Vocabulary Test (PPVT).

The self-contained and resource classes were located side-by-side in average size classrooms within a wing of the school housing administrative offices and first grade classes.

Procedure

Ss were observed during a 30-minute time period at the beginning of the school day. This time-block was designated by the school as "Homeroom." At this point Ss had eaten breakfast and returned to their respective classes. Due to the need for organized class structure and scheduling demands, this time was geared to the reinforcement of general informational skills, consisting of oral drills and the completion of accompanying worksheets. Based on teacher monitoring and evaluation, the number of worksheets completed accurately on a daily basis by each student was inconsistent, with numerous problems with the neatness and appearance of the work noted. At the same time, the level of conversation among students and the volume of noise was observed to be unacceptable for student concentration.

The source of data collected for the study was the worksheets completed following the oral drills. A packet of three, and later four (when the criteria was increased), worksheets was placed on the desks of Ss prior to the students'

arrival in the classroom. These included sheets for name, date, and alphabet; days of the week; numerals and number words zero through ten; months of the year; seasons; and specified handwriting skills. Certain of the worksheets varied according to ability levels, but contained the same basic format and information. With the exception of the sheet containing the name, date and alphabet (which was given daily), all other worksheets were rotated on a random basis. The sheets were orally reviewed by the teacher or para-professional at the beginning of each Homeroom session, with Ss responding appropriately (oral drills). It should be noted that these skills had previously been taught, but required frequent repetition and reinforcement to maintain retention. Ss were subsequently instructed in how to complete each sheet, with explanations concerning expected proficiency. They were given the remainder of the Homeroom period to complete these and turn them in at a designated place in the classroom. All Ss possessed the skills to complete these worksheets with the expected proficiency and in a timely fashion.

A self-recording procedure was selected to increase Ss' awareness of their work and levels of performance and production. The decision to self-record, rather than to self-monitor, was made based on the differences in the two, cited previously (Howell, Rueda, and Rutherford (1983) and others). The behavior to be elicited required that certain instructions be given by the teacher and that rules be followed. The focus was on academic performance and production rather than on on-

task behavior. It was stressed to Ss that this time block was for completing work assignments within a specified amount of time, just as it was during time blocks devoted solely to academics and "book work."

The levels of academic performance and production were assessed by counting the number of worksheets accurately and neatly completed daily by each S. This method can be considered a form of permanent product recording and was chosen for its versatility and convenience. Alberto and Troutman (1986) relate the use of this method to recording increases in work production and increasing self-recording skills in students.

An ABAB reversal design was employed to allow comparison of the self-recording procedure during each phase of the study. These phases were: A1--initial baseline data; B1--initial application of self-recording procedure; A2--reversal to initial baseline procedures with no reinforcement; B2--return to application of self-recording procedure; C1--change in criteria for reinforcement from 3 to 4 worksheets; T1--initial thinning of the reinforcement; T2--additional thinning of the reinforcement to weekly awards; and M1--maintenance period.

During Baseline 1 (A1) the number of worksheets accurately completed was counted and plotted individually for Ss by the teachers. These were marked with a "smiling face" and returned. Worksheets which were incomplete or of poor quality were marked accordingly and given a "sad face" and returned.

The number of worksheets accurately completed were averaged daily and the mean plotted (see figure 1). No other activities were undertaken during this phase.

In the initial application of the self-recording procedure (B1), the idea was introduced and discussed with the students. A section of the room was designated "Work Card Center". Each S was issued a "Work Card" (see Appendix A) for use in the first five day segment. These were stored on a chart with individual pockets bearing the names of each S. Also in "Work Card Center" were charts stipulating rules and expectations, reinforcement and rate of exchange. It was on the Work Cards that the self-recording procedure was performed. The Work Cards were devised to make the school work seem like "real" work. During the initial explanation, a comparison was made between the Work Cards and the time cards used in business. Ss were instructed to pick up their Work Cards upon entering the classroom and, when seated, to put the correct date in the appropriate space. At the completion of the oral drills relating to that day's worksheets, Ss were told to circle "0" on their Work Cards to begin. They were directed to circle the next number (1, 2 or 3--later to 4) as each worksheet was finished and to file their Work Cards when completed or when time was called. Ss were initially guided through this process by the teacher and the para-professional, with all questions being answered and assistance given when needed. Ample time for training was provided during this process to insure a proper level of proficiency. The rules and expectations were

elaborated and Ss were advised to adhere strictly to these before marking the number on the Work Card. The reinforcers were based on the knowledge of the preferences of Ss and consisted of edibles (pieces of hard candy), activities (free time), and tangibles (stickers and incentive awards). The amount or value of reinforcement increased for each consecutive number circled on the Work Card. No reinforcement was presented if only "0" was circled. The reinforcement for having circled "1" on the Work Card (interpreted as having completed one worksheet) was a small scratch 'n sniff smiling face sticker. Circling "2", or completing two worksheets, earned one piece of hard candy, such as an individually wrapped peppermint. The maximum achievement of circling "3" and later "4" (during the C1 phase), or completing three or four worksheets, earned the maximum in terms of reinforcement: one piece of hard candy, a colorful, personalized incentive award, and five minutes of free time to be spent outside unless prevented by weather.

A daily exchange (reinforcement schedule) was used during the initial phase. The time of exchange was set for after lunch, some two to three hours after the filing of Work Cards. This was necessary because of very tight scheduling demands and was desirous to establish the foundation for delayed gratification. It was anticipated that circling consecutive numbers on the Work Cards would provide the basic self-motivation and self-reinforcement and be a satisfactory

immediate reinforcer until the time for exchange. This phase lasted for five days.

The conditions of B1, or Intervention 1, were terminated for the return to baseline conditions (A2) as mandated by the requirements of the reversal design. Ss were told simply that they were not doing Work Cards for a few days. No other explanation was offered, and the same procedures were followed as in A1, again with no attempts at manipulation. This phase lasted for five days.

The self-recording procedure using the Work Cards was reinstated for B2, or Intervention 2, in the same manner as in B1 for another five day period. Upon completion of Intervention 2 (B2), the increase in criterion for delivery of reinforcement occurred (C1--an increase from 3 to 4 worksheets for maximum reinforcement). This phase was officially terminated after five days. The thinning process (T1) began with the elimination of reinforcement for all except maximum achievement. Maximum achievement reinforcement was initially reduced to five minutes of free play daily and an incentive award for the maintenance of maximum behavior for the entire five day school week. The next thinning phase (T2) eliminated the daily free time and substituted the weekly incentive award for maximum achievement with free time. Data at T2 was collected for five days. Following this phase all reinforcement was removed and maintenance data (M1) was collected for forty days to measure long term effects of the self-recording process.

Reliability checks were performed once for each phase of the reversal design. These were conducted by either the teacher of the other mildly mentally handicapped class (during A1) or by the para-professional (all other phases) to check for agreement in the number of worksheets accurately completed by each child and for comparison of these numbers with the actual self-recording. Reliability of 100% was attained across all phases.

Analysis of Data

Since the major focus and purpose of this research was to improve the in-class functioning of a group of mildly mentally handicapped students, no detailed statistical analysis was performed. Rather, simple procedures such as averaging and t-tests were utilized to determine if significant differences existed in the groups' functioning.

RESULTS

A review of Figure 1 indicates a steady increase in the number of worksheets completed for each day during the various phases of the study. Figure 2 presents the average number of worksheets completed during the maintenance phase (T2) of the study. As may be observed from these averages, an increase from 2.0+ worksheets to 3.8+ (T2) to 4.0 at the end of the maintenance period occurred.

Table 1 presents an analysis of t-values for the total groups between the various treatment phases. As may be observed, statistical significance existed between the initial

baseline (A1) and the implementation of the self-recording procedure (B1). Statistical significance was not found between any of the other phases except, perhaps the most important, A1 (initial baseline) and T2 (final thinning). Perhaps more important information than these data is presented in Figure 2. With no other reinforcement than the self-recording process and student intrinsic responses, the level of production not only maintained itself, but actually increased over time to a perfect 4.0 worksheets for each student the final week of recording.

An analysis of the two groups of students (self-contained and resourced), reveals several areas of statistical significance. As may be observed in Table 2, no statistical significance existed between the performance of the two groups on the initial baseline data. On all other treatments, however, a statistically significant difference existed between the performance of the self-contained versus the resourced groups.

As a result of this study, the following findings are presented:

1. No statistically significant difference existed between the performance of the self-contained and resourced groups on the initial baseline data.
2. A statistically significant difference existed between the performance of the self-contained and resourced groups on all other treatment phases in the direction of the self-contained group.

a. B1 to A2 (Intervention phase to return to baseline)

b. A2 to B2 (Return to baseline and return to intervention phase)

c. B2 to C1 (Intervention phase to increase in criterion).

3. Statistical significance for both groups between the various treatments existed:

   a. between A1 (initial baseline) and B1 (intervention 1)

   b. between A1 (initial baseline) and T2 (final thinning).

4. With the removal of all external reinforcement, the level of production was maintained over the forty day maintenance period (M1).

DISCUSSION

The purpose and focus of this study was to develop a procedure which would increase the work performance, production and on-task behavior of a group of mildly mentally handicapped students. The findings support previous studies which indicated the importance of a self-recording and self-monitoring program to the development of self-control behaviors. As may be implied from the data, a simple change in the application of reinforcement from a teacher controlled system to a student controlled procedure resulted in a significant increase in the desired behavior (i.e., increased

productivity, performance and on-task behavior). While the academic work required very little skill, it nevertheless is viewed as essential for young, low-functioning students. Regardless of the amount of skill required, the data reveals that the change in procedure resulted in a significantly positive increase in student performance. While an increase in on-task behavior was observed as academic performance increased, it was not measured and recorded. Therefore, no correlation between the two is stated from these data.

Of particular interest are the differences noted between the two groups (self-contained and resourced) of students on the various treatments. With the exception of the initial baseline data (which indicates that both were functioning roughly the same prior to any intervention), the self-contained group performed far better with the self-recording procedure. This could indicate that the self-contained group needs a structured system like this one, while resourced students have more opportunities to receive other types of reinforcement. It could also indicate that the resourced students became bored with the system and only responded when reinforcement was present. Regardless of the reason, the data indicates that the self-contained group was more affected by the self-recording procedure at each phase. Without the reinforcement present, both groups performed near the maximum level throughout the thinning (T2) and final maintenance period (M1). This supports the use of this technique over a period of time, since satiation did not occur for either group of students.

Implications from this study should be drawn very carefully. This study was not designed to produce a great deal of data for generalization purposes. Rather, it sought to determine the impact of a relatively simple change in classroom procedure on student performance. It was conducted with a population of students well-known to the researchers and with a multitude of interpersonal factors in operation. The results do indicate, however, that systems which place increased responsibility on students for behavior control within the context of an overall management system may significantly improve academic performance. This is an important aspect of a student's progress toward independent functioning which is essential for the development of successful life skills. Teachers would do well to conduct small analysis of data on techniques attempted in the normal function of their classrooms. Many valuable techniques may exist which go unreported to other professionals due to the lack of presentable data. This study has attempted to analyze and present a small portion of the available techniques currently being utilized by special education professionals.

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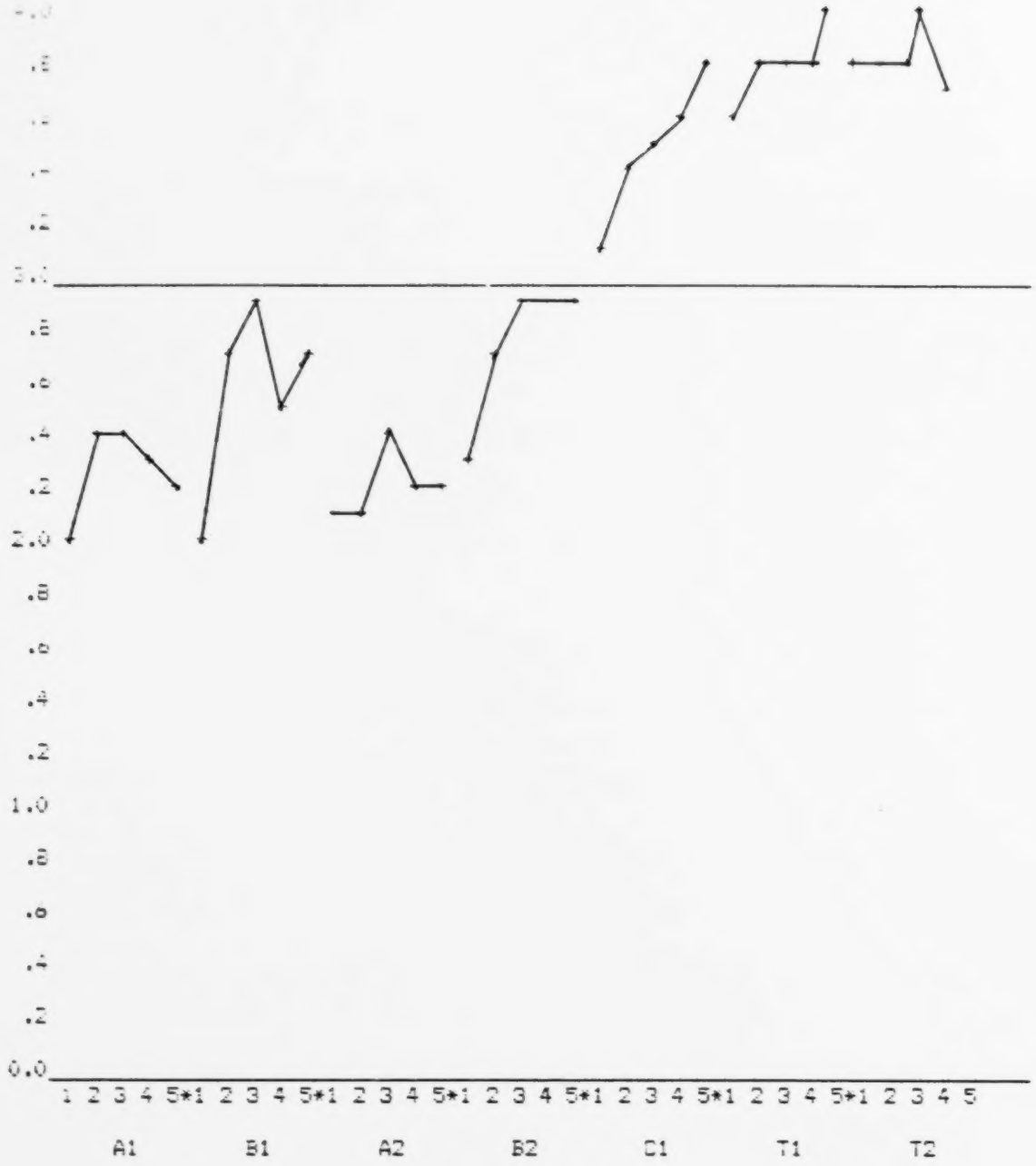
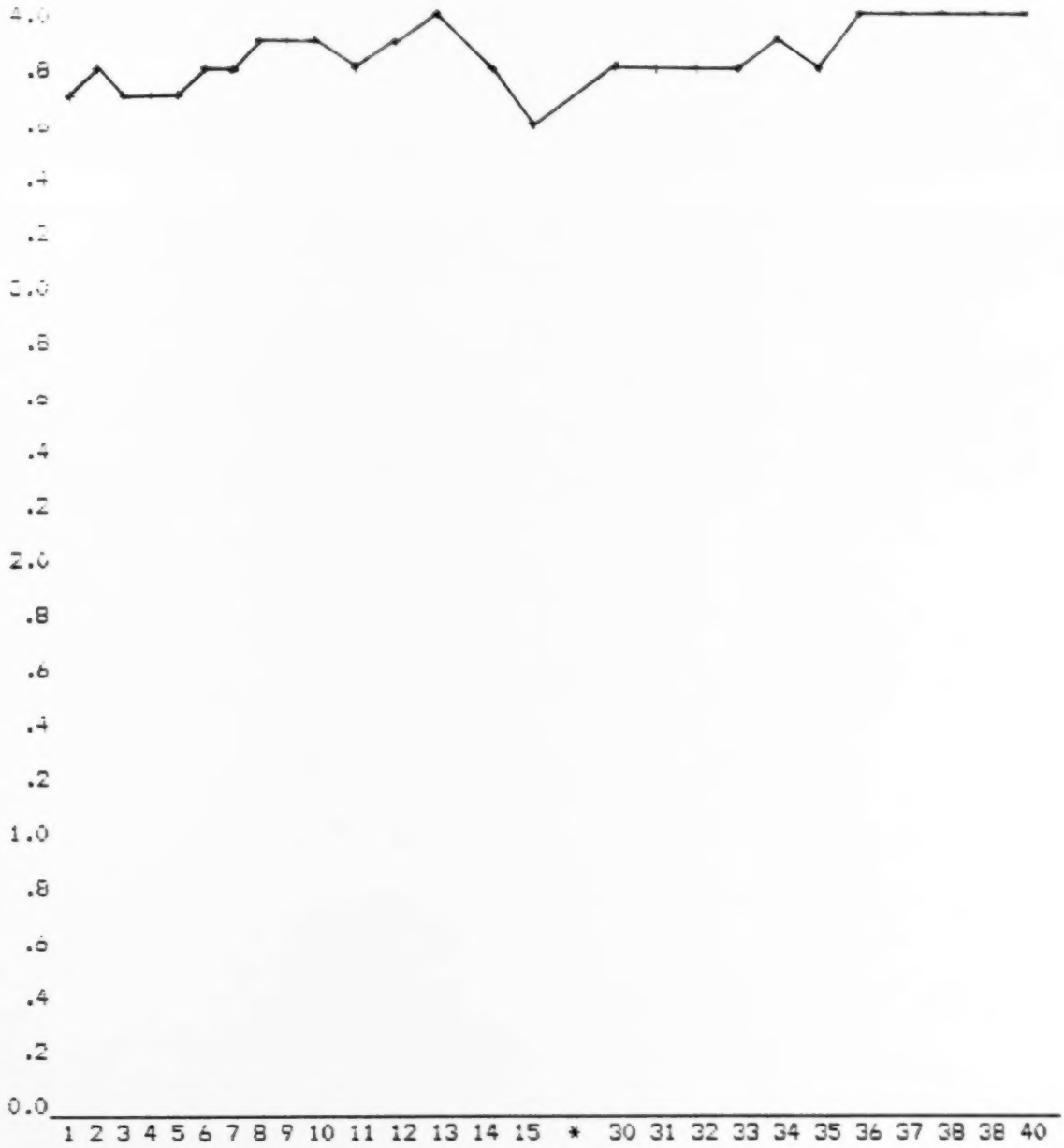
Figure



The average number of worksheets satisfactorily completed per day at each treatment phase.

Figure 2



The average number of worksheets completed during the forty day (M1) maintenance phase.

Table 1

Comparison of Student Performance By Treatment Phase
(Self-contained and Resource)

	Treatment	to	Treatment	t-value	P
	A1		B1		
Mean	8.64		11.83	1.8316	0.0362*
SD	3.44		2.71		
	B1		A2		
Mean	11.83		9.83	-1.6259	0.0548*
SD	2.71		4.46		
	A2		B2		
Mean	9.83		10.94	0.7128	0.2438
SD	4.46		4.88		
	B2		C1		
Mean	10.94		12.00	0.7351	0.2373
SD	4.88		3.20		
	A1		T2		
Mean	9.94		13.72	3.2072	0.0016*
SD	3.44		3.63		

*p<0.05

Table 2

Analysis of Self-Contained Group and Resourced Group
by Various Treatment Phases

Group	A1	B1	A2	[illegible]	
<u>self-contained</u>					
Mean	9.67	13.00	11.11	13.78	14.00
SD	3.04	2.87	4.04	2.44	1.31
<u>resource</u>					
Mean	10.22	10.67	8.56	8.11	10.00
SD	3.96	2.06	4.72	5.16	3.34
t-value	0.3337	-1.9799	-1.2334	-2.9795	-3.1552
P	0.3707	0.0312*	0.1169	0.0043*	0.0035*

* $p < 0.05$

Appendix A

WORK CARD for _____

How many worksheets can you complete?
Circle 0 to begin.
Then circle the next number for each sheet as you finish it.

Date _____	0	1	2	3	
Date _____	0	1	2	3	
Date _____	0	1	2	3	
Date _____	0	1	2	3	
Date _____	0	1	2	3	

WORK CARD for _____

How many worksheets can you complete?
Circle 0 to begin.
Then circle the next number for each sheet as you finish it.

Date _____	0	1	2	3	4
Date _____	0	1	2	3	4
Date _____	0	1	2	3	4
Date _____	0	1	2	3	4
Date _____	0	1	2	3	4

WORK CARD RULES

1. Do your very best work.
2. Work slowly and carefully.
3. Write neatly.
4. Complete everything on the worksheet.

HOW TO MARK YOUR WORK CARD

Circle 0	Begin work.
Circle 1	One sheet complete.
Circle 2	Two sheets complete.
Circle 3	Three sheets complete.

WORK CARD REWARDS

Circled 0	Sorry!!
Circled 1	Sticker
Circled 2	1 piece of candy
Circled 3	Big award. 1 piece of candy, 5 minutes of "Free Time"